Fracking Tracking

Commission monitors water quality of potential fracking sites

By Evan Lubofsky

The data-logging instruments monitor conductivity levels in rivers and creeks to help establish water quality baselines.

The push to develop natural gas resources in the Marcellus Shale, a low-density rock formation that underlies portions of the Delaware River Basin in Pennsylvania and New York, has intensified over the past decade. This is largely due to a growing demand for cheaper energy sources and the adoption of new drilling technologies capable of tapping previously inaccessible areas.

Although drilling for natural gas has remained outside the Delaware River Basin to date, the prospect of future gas development prompted the Delaware River Basin Commission (DRBC) to begin monitoring water quality at various sites in 2011. The goal has been to collect baseline water quality measurements from which post-development water quality comparisons can be made.

"In 2010, DRBC commissioners placed a de facto moratorium on shale gas drilling in the basin pending adoption by DRBC of new regulations specific to natural gas development," said John Yagecic, standards and assessment supervisor for DRBC. "We realized that there was a window of opportunity to establish pre-drilling conditions in the upper section of the basin and collect data before gas development potentially started." In this region, the Marcellus Shale underlies the commission's Special Protection Waters drainage area where regulations require no measurable change to the existing high water quality except toward natural conditions.

Hydraulic fracturing, or fracking, is a widely used method of extracting natural gas from shale source rock, such as that under the Delaware River Basin. The process involves drilling wells to reach shale formations deep in the Earth's surface and then injecting water, sand and chemicals at high pressures into the layers to release the gas.

According to the U.S. Environmental Protection Agency (EPA), flowback wastewater created from the process can contain high levels of total dissolved solids, fracturing fluid additives, metals and naturally occurring radioactive materials. This "fracking water" typically is stored at the well site for later treatment or disposal. It is estimated that in the U.S. there are currently 144,000 disposal wells receiving up to 2 billion gal of fluid per day.

As such, fracking is a highly controversial issue, with many environmentalists concerned about its potential environmental impact on groundwater and aquifers. Proponents, however, feel the potential benefits—job creation and cheaper domestic

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energy—outweigh the potential risks. Regardless, comprehensive water quality monitoring has become an important element in understanding the potential environmental consequences of hydraulic fracturing activities. The DRBC has implemented its own monitoring program that looks at various water quality parameters typically affected by natural gas development.

Tracking Conductivity Levels

As part of the monitoring program, the DRBC's Monitoring, Modeling & Assessment Branch has been monitoring specific conductivity levels—a measure of how easily an electrical current can pass through water—in the Delaware and Lackawaxen rivers, as well as in four creeks in Pennsylvania and New York, areas where drilling is likely to take place first if regulations are adopted.

According to Yagecic, conductivity is a key parameter in establishing water quality baselines, as it can be an indicator of contamination.

"Total dissolved solids, chloride and sodium are all closely associated with conductivity, so it appeared conductivity would be a good real-time continuous monitoring parameter to measure," he said. "We also wanted to measure this parameter through the winter months [because] road de-icing with salt could cause a short-term rise in specific conductivity unrelated to natural gas development."

Currently, conductivity levels are being continuously monitored with HOBO U24 data logging instruments from Massachusetts-based Onset. These flashlight-sized devices measure actual conductivity and temperature, and are particularly useful in underwater environments where relatively small changes in salinity (±5,000 µS/cm) are likely to occur as a result of upwelling, rainstorms or discharge events.

Prior to installing the loggers, DRBC staff tested their accuracy against other meters by taking measurements in a variety of low- and high-conductivity waters such as ultra-pure lab water, tap water and salt water. Through this process, staff scientists were able to verify that the logger measurements were in good agreement with calibration standards and other meters, and responded appropriately to fluctuations in conductivity.

In order to install the instruments underwater in a secure fashion, they needed to be attached to low-profile concrete bases, which the DRBC team constructed by pouring concrete into a saucer sled. Two short aluminum pipes jut out from the concrete base, and a horizontal PVC pipe with holes lies affixed to the base to house the data logger, which is secured with zip ties. The placement of the data logger within the PVC pipe minimizes bubbles as well as sediment that might otherwise accumulate on the sensor and cause fouling-related errors.

The loggers are retrieved about every three weeks at which time data is offloaded in the field onto a handheld data shuttle device. This stores the data and allows for its safe transport back to the lab for analysis. During analysis, Onset's HOBOware graphing and analysis software converts the collected measurement data into graphs that display trend logs of both specific conductivity and temperature data over the monitoring period. The data loggers are then cleaned with distilled water and redeployed back into the waterways.

Using the Data

By defining the range and variability of specific conductivity measurements, this monitoring program will help the DRBC protect precious water resources in the Delaware River Basin if natural gas development activities commence. The commission will be in a stronger position to minimize impacts from gas development and to compel remedial action if impacts to water resources do occur.

In the meantime, things have been quiet on the data front. Since monitoring began in 2011, there has not been any evidence of significant fluctuations in conductivity levels within each waterway, although the data has identified differences between the various streams.

"This is all pre-gas baseline data, so we haven't expected to see anything surprising," Yagecic said. "But the data does show that different streams in the same region have different conductivity distributions. If gas development does commence, this data will be invaluable for knowing the pre-gas condition." **iWWD**

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